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## Composite Roof Panels

### Field

This invention relates to composite roofing panels and especially panels used for construction of pitched roofs of  
5 buildings.

### Background of the Invention

The present invention relates to building construction and in particular to the construction of pitched rooves of dwellings  
10 having roofing panels extending between the top of a wall of the building and the ridge.

A roofing panel may have a construction similar to the building panel disclosed in the present applicant's UK patent  
15 application GB0306407.8 with reinforcing beams within the panel extending between the wall and the ridge. Adjacent panels may be linked together as is shown in the above application to form a roofing surface ready to receive battens and roofing tiles.

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The applicant has devised a novel means for securing a roofing panel to both the ridge and wall of a building, and in particular, but not necessarily, to a building having inner walls constructed from modular building panels as are  
25 described in the applicants patent application GB-A-2391027.

Statements of Invention

According to the present invention there is provided an attachment means for roof panels of a pitched roof, and which  
5 comprise an elongate strut in cross-section has a portion substantially in the form of a right angle triangle with an apex angle substantially equal to the pitch angle of the roof, and a base side adapted to locate in a recess in the end of a roof panel.

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The attachment means may be hollow and is formed from a wooden shell, preferably formed from plywood. The hollow centre of the shell may be filled with a core of cellular material.

15

The attachment means may be a lower attachment means which in use is secured to the lower ends of panels adjacent the eaves, and the base side of which has a projecting tongue which engages in a recess in the lower end of a panel  
20 preferably so that the two sides of the panel are substantially flush with the respective ends of the base side. The hypotenuse side of the lower attachment means in use is substantially vertical providing a fixing surface for guttering and soffits.

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The attachment means may additionally or alternatively be an upper attachment means which in use is secured the upper end of the panels, the base side thereof being adapted to engage in a recess in the upper end of a panel. Preferably, the  
5 hypotenuse side has an inverted "T" shaped slot formed therein for locking onto a ridge beam of a roof.

The cellular material in the core is preferably comprises a plurality of layers of corrugated paper or cardboard which  
10 are adhered together using a suitable polymeric resin, for example a water based PVA.

Preferably the attachment means has a sufficient length to transverse a plurality of roof panels and link them together.  
15

The present invention further comprises a roofing panel having panel having attachment means according to the present invention located at one or both ends of said panel.

20 Such a roofing panel may have a rectangular frame having both faces face covered in a board material, the frame comprising top and bottom rails, typically formed from "H" or "U" section water resistant composite with recesses facing outwardly of the panel, and the two rails are joined together  
25 by a plurality of composite "I" beams as described in Patent application GB0405929.1 extending therebetween. An advantage

of the present invention is that it allows the production of standardised modular roof panels which can adapted for different pitch rooves simply by the use of different attachment means having a selected apex angle, for example  
5 45° or 60°, to suit the pitch of the particular roof.

In a method of securing the above roof panel to the ridge beam of a roof, the ridge beam is provided with a "T" section location strip which is loosely engagable in an undercut slot  
10 in the attachment means with the location strip being locked in the slot by insertion of a locking strip.

The lower end of a roof panel is held to angled ends faces of cross beams by eaves brackets.

15

#### Description of the Drawings

The invention will be described by way of example and with reference to the following drawings in which:

20 Fig. 1 is an isometric exploded view of a roof panel made from I beams and having attachment means according to the present invention.

Fig. 2 is a cross section of a roof panel and attachment means according to the present invention,

25 Fig. 3 is an isometric view of a hanger for the lower end of the roofing panel.

Detailed Description of the Invention

With reference to Figs. 1, there is shown a roof panel 110 which is a module for building the roof of a dwelling or other building. The panel 110 has predetermined standard dimensions for matching with and assembly to other modular panels, for example width W of 1000mm, thickness T of 130mm, and height H up to 8 metres. Other panels according the present invention may have differences to at least some of the above dimensions.

10

Each panel 110 has a rectangular frame 111, having top and bottom rails 112, 113 interconnected by a plurality of I Beams 41 & 10 which respectively form the sides and vertical struts of the frame 111 and are spaced at predetermined distances apart across the width of the panel. A preferred spacing between I beams 10 & 41 is 400mm. A board having a width of 1000mm will only have a single I beam 10 at its centre.

20 The frame 111 is covered on one face, which in use faces externally of the building, with water resistant board 116 and its other face which in use faces inwardly of the building with a second water resistant board 117. The boards 116 and 117 are preferably 6mm plywood or OSB. The internal and external boards 117 & 116 respectively are bonded to the beams 10 & 41.

The top rail 112 comprises a recessed channel in section, and is preferably "H" shaped section channel formed from water resistant wood composite, preferably 12mm plywood .

The bottom rail 113 also comprises a recessed channel in section and is preferably a substantially "U" shaped section rail. The H shaped rail 112 has open sided recesses 43 which face both inwardly and outwardly of the frame 111. The inwardly facing recess 43 receives stepped end portions of the I-beams 10 & 41 and the outwardly facing recess 43 receives an elongate strut 102 which is used as an upper attachment means 102 for fixing the panels 110 to the ridge beam of a roof during construction. The bottom rail 113 is oriented with its recess 33 facing downwards to receive an elongate strut 101 which is used as a lower attachment means 101. The lower attachment means 101 is used for securing guttering, soffits etc. to the end of the roof panel 110.

A plurality of panels 110 are arranged side by side extending from the ridge of a roof to the eaves to form one side of a roof. Adjacent panels may be linked together using a jointing post (not shown) located in respective recesses 30 on the outer sides of the beams 41. The jointing post engages dowels 31 located along the webs of the respective I beams. The jointing posts are described in the applicants earlier application GB-A-2391027.

Referring now also to Fig. 2 each "I" beam 10, 41 is a composite beam fully described in GB 0405929.1 having plywood flanges 11,12 linked by a composite central web 13 so that recesses 30 are formed either side of the web. The overall depth D and width W of the beam 10 will be determined by the end use of the beam and material used for its construction. The present example for a roof panel the beam will be about 100mm x 100mm.

- 10 The flanges 11,12 are formed from 6mm plywood with the grain of the outer veneers extending longitudinally of the beam.

The web 13 is composite structure comprising two spaced apart sidewalls (not shown) with a light weight cellular material core 14 filling the cavity therebetween. The cellular material is preferably a corrugated paper or cardboard impregnated by a polymeric resin. The two side wall boards may be formed from one of plywood, hardboard, or card board. Composite beams 10 & 41 are structurally very rigid and do not bend under their own weight having an extremely high bending moment per unit mass.

The lower attachment means 101 has a portion substantially in the form of a right angle triangle in cross-section having its base side 51 adapted to engage in the recess 33 in the bottom rail 113 of the roof panel 110. The apex angle  $\alpha$  is



substantially equal to the pitch angle of the roof so that the hypotenuse side 53 is in use substantially vertical. The side 53 is used for the attachment of guttering and/or soffit (not shown). The third side 52 of the attachment means lies

5 substantially flush with the inner board 117. The lower attachment means 101 is preferably hollow and the hollow core may filled in a similar manner to the I beams 10, 41 if desired. The attachment means 101 may be assembled from machined timber, or plywood, and is of a sufficient length to

10 transverse a plurality of roof panels to link them together at the their lower ends.

The upper attachment means 102 is similar to the attachment means 101 and again has a portion with a cross-section

15 substantially in the form of a right angle triangle with its base side 61 adapted for location within the recess 43 in the top rail 112. The apex angle  $\beta$  of the attachment means is again substantially equal to the pitch angle of the roof so that the hypotenuse side 63 is substantially vertical in use.

20 The third side 62 is substantially flush with the outer board 116 of the panel 110.

Both attachment means 101 & 102 are secured in their respective rails 113, 112 by screws or nails.

25

The apex angles  $\alpha$  and  $\beta$  of the lower and upper attachment means 101, 102 are selected to suit a particular roof pitch angle. A number of different attachment means having different select apex angles may be produced. This allows  
5 standard panels 110 to be produced and adapted to different roof pitches simply by assembling different select attachment means in the upper and lower rails 112, 113 of the panel.

The roof panel 110 is secured to the ridge beam 65 of a roof  
10 by the upper attachment means 102. The hypotenuse side 63 has an inverted T slot 66 formed within the side which is loosely engagable with a T shaped location strip 67 fixed to the ridge beam. The relative dimensions of the slot 66 and location strip 67 are such that the mouth of the slot 66 can  
15 pass over head of the location strip 67. The upper end of the panel is then lowered so that the head of the location strip 67 engages in the detent formed by one arm of the T-shaped slot. The panel is then held on the location strip 67 by means of a shaped locking strip 68 which is inserted  
20 lengthwise into the slot 66. The upper attachment means 102 may be finally nailed to the ridge beam 65.

The location strip 67 on the beam may be elongated to provide location for a plurality of side by side roof panels and the  
25 locking strip 68 may serve to lock a single panel in location or a plurality of side by side panels.

The ridge beam 65 is a composite rectangular section beam of a similar construction to the I beams 10 & 41. The ridge beam 65 comprises an outer shell 69, preferably plywood, having a core filled with a resin impregnated cellular filler, preferably corrugated cardboard.

The lower ends of the panels 110 are located on the shaped ends of cross beams 71 which form the ceiling immediately below the roof. The lower ends of the panels 110 are secured in position using shaped eaves brackets 72, see Fig. 3, which are secured to the cross-beam 71 and to the interior board 117 of the panel. The brackets 72 have a planar base 73 which sits against the underside of the panel and a pair of spaced apart side walls 74 which locate one on each side of the beam 71. The bracket 72 is fastened to the beam 71 and panel 110 using conventional fasteners e.g. nails, screws etc.

The panels 110 may be supplied already covered with roofing felt or membrane 75 and with longitudinally extending battens 76 fixed in position. The battens 76 will be aligned with and fixed to the I beams 10, 41 within the panels and are utilised for the attachment of battens for roofing tiles, slates etc.

Alternatively once a plurality of roofing panels 110 are secured to form a roof surface, the surface may be felted and battened.